



**UNSW**  
THE UNIVERSITY OF NEW SOUTH WALES

FACULTY OF MEDICINE

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF PHARMACOLOGY

**PHAR 3202**

**Neuropharmacology**

COURSE OUTLINE

SESSION 2, 2014

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## PHAR3202 Course Information

Neuropharmacology (PHAR3202) is a 3<sup>rd</sup> year Science Course worth Six Units of Credit (6 UOC). The course will build on the information you have gained in Pharmacology (PHAR2011) and Physiology (2101 & 2201) as well as Biochemistry (BIOC2101/2181) and Molecular Biology (2201/2291) or Chemistry (2021/2041).

### OBJECTIVES OF THE COURSE

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Building on basic pharmacology skills learned in PHAR2011, the objectives of this course are to a) provide both knowledge and conceptual understanding of the use and action of various classes of drugs in the treatment of different human diseases affecting the brain and b) develop an appreciation of the need for further research to identify new drug targets for more effective therapies.

### COURSE CO-ORDINATOR and LECTURERS:

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Course Co-ordinators:

Dr Nicole Jones

Room 327

Wallace Wurth East

Ph: 9385 2568

[n.jones@unsw.edu.au](mailto:n.jones@unsw.edu.au)

Consultation time: Monday 12-1pm

(outside these times please be sure to make an appointment via email as undergraduate students do not have access to the upper floors of the Wallace Wurth building)

Professor Margaret Morris

Room 322

Wallace Wurth East

Ph 9385 1560

[m.morris@unsw.edu.au](mailto:m.morris@unsw.edu.au)

Students wishing to see the course coordinator outside consultation times should make an appointment via email.

Lecturers in this course:

Dr. Trudie Binder

[w.binder@unsw.edu.au](mailto:w.binder@unsw.edu.au)

A Prof Kay Double

[kay.double@sydney.edu.au](mailto:kay.double@sydney.edu.au)

Dr. Ross Grant

[r.grant@unsw.edu.au](mailto:r.grant@unsw.edu.au)

Dr. Nicole Jones

[n.jones@unsw.edu.au](mailto:n.jones@unsw.edu.au)

Dr. Gila Moalem-Taylor

[gila@unsw.edu.au](mailto:gila@unsw.edu.au)

Prof. Margaret Morris

[m.morris@unsw.edu.au](mailto:m.morris@unsw.edu.au)

### COURSE STRUCTURE and TEACHING STRATEGIES

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Learning activities occur on the following days and times:

- Lectures: Monday (11am-12pm), Wednesday (1-2pm)
- Tutorials: Thursday (\*11am-12pm or \*3-4pm)
- Practicals: Friday (\*9am-12pm or \*1-4pm).

\*Once enrolled in one of the two tutorial or practical sessions, students cannot change.

Students are expected to attend all scheduled activities for their full duration (2 hours of lectures per week and up to 4 hours of practical and tutorial sessions per week). Students are expected to attend all scheduled activities for their full duration. Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150-180 hrs of study and learning activities. The formal learning activities are approximately 76 hours throughout the semester and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

Lectures will provide you with the concepts and theory essential for understanding the mechanism of action and clinical effects of drug classes which are used to treat CNS disorders. For each disease the pathological process will be outlined in the lecture and the relevant drug targets in the disease process identified and current pharmacological treatments will be described. While lectures will focus on the

mechanism of action and adverse effects of drugs currently in use, potential new therapies, drug targets and areas requiring further research for more effective therapies, will be identified and discussed.

To assist in the development of research and analytical skills practical classes and tutorials will be held. These classes and tutorials allow students to engage in a more interactive form of learning than is possible in the lectures. The skills you will learn in practical classes and tutorials are relevant to your development as professional scientists.

## APPROACH TO LEARNING AND TEACHING

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The learning and teaching philosophy underpinning this course is centred on student learning and aims to create an environment, which interests, challenges and enthuses students. The teaching is designed to be relevant and engaging in order to prepare students for future careers.

Although the primary source of information for this course is the lecture material, effective learning can be enhanced through self-directed use of other resources such as textbooks and Web based sources. Your practical classes will be directly related to the lectures and it is essential to prepare for practical classes before attendance. It is up to you to ensure you perform well in each part of the course; preparing for classes; completing assignments; studying for exams and seeking assistance to clarify your understanding.

## STUDENT LEARNING OUTCOMES

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PHAR3202 will develop those attributes that the Faculty of Science has identified as important for a Science Graduate to attain. These include; skills, qualities, understanding and attitudes that promote lifelong learning that students should acquire during their university experience.

### Graduate Attributes

- A. Research, inquiry and analytical thinking abilities
- B. The capability and motivation for intellectual development
- C. Ethical, social and professional understanding
- D. Effective communication
- E. Teamwork, collaborative and management skills
- F. Information Literacy – the skills to locate, evaluate and use relevant information.

On completion of this subject students should:

1. Be able to describe the synthetic and metabolic pathways of the major CNS neurotransmitters
2. Be able to list examples of drugs used to treat major classes of brain and mind disorders.
3. Be able to outline the mechanism of action of specified drug classes used to treat the major types of brain and mind disorders.
4. Be able to communicate scientific information in a report.
5. Be able to demonstrate their ability to work in teams and communicate scientific information effectively.

## ASSESSMENT PROCEDURES

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• Progress exam (40 min duration)	<b>10%</b>
• Practical report	<b>10%</b>
• Practical quizzes (5 in total)	<b>5%</b>
• Assignment – “Controversial Research Topic in Neuropharmacology”	<b>15%</b>
• End of session examination (2 hours duration)	<b>60%</b>

The *practicals and tutorials* are provided to support lecture material and practise analytical skills. The practical classes and tutorials help you to develop graduate attributes A, C, D & E. During the practical course you will be required to submit a written report for one of the practical sessions. The report itself should be in the form of a scientific communication comprising aims, results and discussion. Reports must be legible and as concise as possible, and are limited to a maximum of 4 pages of writing (excluding tables,

figures and computer traces). The report will be due one week after the relevant practical class. Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the BABS.SOMS.BEES (B.S.B.) Student Office, located on the Ground Floor Room G27, of the Biosciences Building. Office hours are 9.00 am - 4:30pm. A penalty will apply for late submissions. Material covered in the practical classes and tutorials will be examined.

### **Student assignment**

Students will work in teams of 3-4 to research a “Controversial Research Topic in Neuropharmacology”. Each group member must participate in the development of an argument for or against the topic and groups will make their presentations in weeks 8 and 9. Groups and topics will be assigned in the first practical session. Individual group members will be required to submit a 500 word synopsis of their own debate topic. This assessment task will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate your ability to work in a team and collaborate successfully (Graduate attributes A, D, E & F). Marking criteria will be distributed along with assignment details at the first tutorial session. Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the BABS.SOMS.BEES (B.S.B.) Student Office, located on the Ground Floor Room G27, of the Biosciences Building. Office hours are 9.00 am - 4:30pm. A penalty will apply for late submissions (10% per day).

Written Assessment tasks must also be submitted electronically *via* Moodle, through Turnitin.

The *progress examination* will be held during the lecture session (September 10<sup>th</sup>) in week 7. This exam will give you feedback on how you are succeeding in the course. The *progress examination* and *end of session examination* will test not only your knowledge of drugs used to treat major classes of brain and mind disorders but also your ability to apply the knowledge you have acquired from multiple lectures. The progress examination will be in the form of multiple choice and short answer questions. The questions will be based on the material covered in the lectures, practical classes and tutorials. Material covered prior to the progress exam may be again examined in the final exam. The exam will address graduate attributes A and B. The end of session examination will be held during the official examination period.

### **TEXTBOOK AND READING LIST**

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Recommended Primary Text:

- Nestler, Hyman and Malenka; *Molecular Neuropharmacology: A Foundation for Clinical Neuroscience*. 2<sup>nd</sup> Edition McGraw Hill, 2008. This book is available for purchase through the UNSW bookshop and there will be a copy available in the UNSW library.

Additional reading suitable as Secondary Resources:

- Rang, Dale, Ritter Flower and Henderson; “Rang and Dale’s” *Pharmacology* 7<sup>th</sup> Edition. Elsevier, Churchill Livingstone, 2012. This textbook is available from the UNSW bookshop and there are copies available in the UNSW library
- Brunton, Lazo and Parker; Goodman and Gilman’s *The Pharmacological basis of therapeutics*. 11<sup>th</sup> Edition. McGraw Hill. There are copies of this textbook and there is also an electronic resource – both are available through the UNSW library.

Other Resources:

- Additional articles of interest will be placed on the course pages on Blackboard

### **COURSE EVALUATION AND DEVELOPMENT**

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Each year feedback is sought from students about the courses offered in the Department of Pharmacology and continual improvements are made based on this feedback. The Course and Teaching Evaluation and Improvement [CATEI] Process of UNSW is the way in which student feedback is evaluated and significant changes to the course will be communicated to subsequent cohorts of students. Also a staff-student liaison group will be set up and students will be invited to become class representatives to seek feedback from their colleagues and meet with academic staff to discuss any issues that arise.

Based on student feedback received 2010-2013 the following changes have been made: the student assignment and has now been allocated a larger proportion of the total assessment marks – 15%. The tissue culture practical class is modified and an accompanying tutorial has been added, to allow students a chance to research and design their own neuroprotection experiment (within class time and resource constraints), and time to work on group assignments has been allocated within prac class sessions. A groupwork log task has also been added to the group assignment.

## GENERAL INFORMATION

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The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located on the lower ground, 2<sup>nd</sup> and 3<sup>rd</sup> floors of the Wallace Wurth building. General inquiries can be made at the BABS.SOMS.BEES (B.S.B.) Student Office, located on the Ground Floor Room G27, of the Biosciences Building. Office hours are 9.00 am - 4:30pm.

**Professor Margaret Morris** is Head of Department and appointments may be made through the Administrative Assistants in Wallace Wurth.

**There is an honours program conducted by the School.** There are two honours programs within the School of Medical Sciences (SOMS), the SOMS Honours Program and the Neuroscience Honours Program. The SOMS Honours Program is currently coordinated by Dr Andrew Moorehouse ([a.moorehouse@unsw.edu.au](mailto:a.moorehouse@unsw.edu.au); Ph: 9385 2924), and Dr. John Power, is the coordinator for Neuroscience Honours ([john.power@unsw.edu.au](mailto:john.power@unsw.edu.au), Ph: 9385 1676). Any students considering an Honours year should discuss the requirements with the Honours co-ordinator. Outstanding students may be considered for scholarships offered by the University and School and these are offered annually.

### **Postgraduate research degrees**

The Department of Pharmacology offers students the opportunity to enter into the following graduate programs:

**Course Work Masters:** Masters in Drug Development. For more information contact Dr Orin Chisholm ([o.chisholm@unsw.edu.au](mailto:o.chisholm@unsw.edu.au) )

**Research Masters:** In Pharmacology. For more information contact the postgraduate co-ordinator Dr Pascal Carrive ([p.carrive@unsw.edu.au](mailto:p.carrive@unsw.edu.au) )

**Doctorate (Ph.D):** In Pharmacology. For further information contact the postgraduate co-ordinator Dr Pascal Carrive ([p.carrive@unsw.edu.au](mailto:p.carrive@unsw.edu.au) )

**Departmental Vacation Scholarships:** The Department of Pharmacology supports several summer vacation scholarships each year to enable good students to undertake short research projects within the department. For further details contact the Administrative Officer.

### **The School Teaching Administrator**

Ms Carmen Robinson is able to provide additional information on any courses offered by the School. She is located in the BABS.SOMS.BEES (B.S.B.) Student Office, G27 Biosciences Building.

Ph: 9385 2464, Email: [Carmen.Robinson@unsw.edu.au](mailto:Carmen.Robinson@unsw.edu.au)

## OFFICIAL COMMUNICATION BY EMAIL

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All students in the course PHAR3202 are advised that e-mail is now the official means by which the School of Medical Sciences at UNSW will communicate with you. All e-mail messages will be sent to your official UNSW e-mail address (e.g. z1234567@student.unsw.edu.au) and, if you do not wish to use the University e-mail system, you MUST arrange for your official mail to be forwarded to your chosen address. The University recommends that you check your mail at least every other day. Facilities for checking e-mail are available in the School of Medical Sciences and in the University library. Further information and assistance is available from IT Services at UNSW (<http://www.it.unsw.edu.au/students/index.html>.)

***Note on Email etiquette:*** When contacting a lecturer with a query, all email communications should be in formal business English; students should include their name, student number and course name and number.

## **ATTENDANCE REQUIREMENTS**

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**Attendance at practical classes is compulsory, and must be recorded in the class roll ON THE DAY OF THE CLASS. Arrival more than 15 minutes after the start of the class will be recorded as non-attendance. It is your responsibility to ensure that the demonstrator records your attendance and no discussions will be entered into after the completion of the class.** Satisfactory completion of the work set for each class is essential. It should be noted that non-attendance for other than documented medical or other serious reasons, or unsatisfactory performance **for more than 1 practical class during the session** may result in an additional practical assessment exam or ineligibility to pass the course.

The University acknowledges that students are involved in many extra-curricular activities throughout their studies. The School of Medical Sciences is generally supportive of students' activities but must be confident that these do not significantly impact on attendance at scheduled teaching activities or completion of assessment requirements.

Guidelines on extra-curricular activities affecting attendance can be found on the School of Medical Sciences Website.

<http://medicallsciences.med.unsw.edu.au/sites/default/files/Extra-curricularActivitiesSOMS.pdf>

## **BEHAVIOUR IN PRACTICAL CLASSES**

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The practical class is an opportunity for students to develop graduate attribute C by behaving in an ethical, socially responsible and professional manner within the practical class.

- Punctual arrival is expected.
- Turn off mobile phones before entering the class.
- A lab coat must be worn when required for practical classes.
- Enclosed shoes are compulsory.

Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. Those who don't adhere to these basic laboratory rules will be marked absent.

## **PRACTICAL CLASSES**

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The experimental procedure and safety information for each practical is given in this course outline. Students are required to familiarise themselves with the experimental procedure before attending each class. In the interests of safety, special attention should be paid to any precautionary measures recommended in the notes. If any accidents or incidents occur they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.

**Animal Experimentation:** The procedures used in the laboratory classes involving *the use of animals* have been approved by Animal Care and Ethics Committee (registration number 13/76B). All experiments undertaken in the Department of Pharmacology adhere to the NHMRC code of conduct for animal experimentation.

## **TECHNOLOGY ENABLED LEARNING AND TEACHING RESOURCES**

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The Department of Pharmacology has chosen to use the University's central Moodle service to provide teaching material for all of its courses.

- To access these materials, go to the TELT, or Technology Enabled Learning and Teaching web site <http://telt.unsw.edu.au/>.
- Click on "Login to UNSW Moodle" and log on using the "Web Single Sign On" service

- After logging on to Moodle, look for the course PHAR3202. You should have access to it if you are properly enrolled.
- You can make use of Echo360 recordings taken of the lectures that are available on Moodle. Lecture slides will also be made available on Moodle.

## HANDWRITING

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Students whose writing is difficult to understand will disadvantage themselves in their written assessment. Make every effort to write clearly and legibly. Do not use your own abbreviations.

## SPECIAL CONSIDERATION

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**Please note the following Statement regarding Special Consideration.**

Students who believe that their performance, either during the session or in the end of session exams, may have been affected by illness or other circumstances may apply for special consideration. Applications can be made for compulsory class absences such as (laboratories and tutorials), in-session assessments tasks, and final examinations. **Students must make a formal application for Special Consideration** for the course/s affected as soon as practicable after the problem occurs and **within three working days of the assessment to which it refers.**

Students should consult the A-Z section of the “Student Guide 2014”, particularly the section on “Special Consideration”, for further information about general rules covering examinations, assessment, special consideration and other related matters. This information is published free in your UNSW Student Diary and is also available on the web at: <https://my.unsw.edu.au/student/atoz/SpecialConsideration.html>

## HOW TO APPLY FOR SPECIAL CONSIDERATION

Applications must be made via Online Services in myUNSW. **You must obtain and attach Third Party documentation before submitting the application. Failure to do so will result in the application being rejected.** Log into **myUNSW** and go to **My Student Profile tab > My Student Services channel > Online Services > Special Consideration.** After applying online, students must also verify supporting their documentation by submitting to [UNSW Student Central](#):

- Originals or certified copies of your [supporting documentation](#) (Student Central can certify your original documents), and/or
- A completed [Professional Authority form \(pdf - download here\)](#).

**The supporting documentation must be submitted to Student Central for verification within three working days of the assessment or the period covered by the supporting documentation. Applications which are not verified will be rejected.**

**Students will be contacted via the online special consideration system as to the outcome of their application. Students will be notified via *their official university email once an outcome has been recorded.***

## SUPPLEMENTARY EXAMINATIONS

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The University does not give deferred examinations. However, further assessment exams may be given to those students who were absent from the final exams through illness or misadventure. Special Consideration applications for final examinations and in-session tests will only be considered after the final examination period when lists of students sitting supplementary exams/tests for each course are



determined at School Assessment Review Group Meetings. Students will be notified via the online special consideration system as to the outcome of their application. You cannot assume you will be granted supplementary assessment. **It is the responsibility of all students to regularly consult their official student email accounts and myUNSW in order to ascertain whether or not they have been granted further assessment.**

**NOTE: The supplementary exam will be held in the week beginning the 8<sup>th</sup> December**

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### MISSED TESTS

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If you unavoidably miss one of the tests in PHAR3202, you must inform the course coordinator immediately. You must supply adequate documentation (medical certificate) to be considered for any supplementary tests. Such tests may consist of an oral examination that will be held during the first week of the stuvac period.

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### MEDICAL CERTIFICATES

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Students who miss practical classes due to illness or for other reasons must submit a copy of medical certificates or other acceptable documentation to the course co-ordinator. **Certificates should be lodged no more than 7 days after an absence. Certificates lodged after 7 days will not be accepted.** The following details must be attached: Name, Subject number, Group number, Date of the class, Name of class/es missed.

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### REPEATING STUDENTS

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Practical class exemptions may be granted to repeat students but students **must** check with the course co-ordinator whether they have exemption **prior** to their first practical class. All students must be familiar with the material covered in the practical classes.

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### STUDENT SUPPORT SERVICES

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Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course coordinator prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the EADU 9385 4734. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Student Equity and Disabilities Unit, Ground Floor of the Goodsell Building

Tel: +61 2 9385 4734/5434

Email: [seadu@unsw.edu.au](mailto:seadu@unsw.edu.au)

Website: [www.studentequity.unsw.edu.au](http://www.studentequity.unsw.edu.au)

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### STUDENT RIGHTS AND RESPONSIBILITIES

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<https://my.unsw.edu.au/student/resources/Policies.html#StudentResponsibilities&Conduct>

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### APPEALS PROCEDURES

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Details can be found at MyUNSW via the link:

[https://my.unsw.edu.au/student/academiclife/assessment/finalisation\\_results.html](https://my.unsw.edu.au/student/academiclife/assessment/finalisation_results.html)

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### GRIEVANCE RESOLUTION OFFICER

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In case you have any problems or grievance about the course, you should try to resolve it with the Course Coordinator (Dr Nicole Jones ph: 9385 2568, [n.jones@unsw.edu.au](mailto:n.jones@unsw.edu.au)) or the Head of Department (Prof Margaret Morris ph: 9385 1560, [m.morris@unsw.edu.au](mailto:m.morris@unsw.edu.au)). If the grievance cannot be resolved in this way,

you should contact the School of Medical Sciences Grievance Officer, Dr Priti Pandey (9385 2483, [p.pandey@unsw.edu.au](mailto:p.pandey@unsw.edu.au)).

## PLAGIARISM

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The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalised by the award of a score of zero for the assessable work. Evidence of plagiarism may result in a record being made in the Central Plagiarism Register and the Faculty Students Ethics Officer being notified.

### What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.\* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†
- For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.
- Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.
- Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.
- The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.
- The Learning Centre website is the main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via: [www.lc.unsw.edu.au/plagiarism](http://www.lc.unsw.edu.au/plagiarism)

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

\* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

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# Neuropharmacology

## LECTURE OUTLINES

The course timetable is appended at the end of these notes and can also be found on Moodle.

The course is divided into 5 main themes covering Neuropharmacology

1. Introduction to Neuropharmacology
2. Neurotransmitter and Receptor systems in the brain
3. Brain Disorders – and drugs used to treat them
4. Analgesics and Anaesthetics
5. Neurodevelopment and Neuroimmunology

### **1. Introduction to Neuropharmacology**

This lecture will provide an introduction to neuropharmacology - the study of drugs that affect the brain. It will briefly review the way that nerve cells communicate to each other via chemicals and receptors and provide an overview of the variety of different chemicals and receptors utilized and the nerve pathways and neuronal functions associated with different neurotransmitter systems.

### **2. Neurotransmitter and Receptor systems in the brain**

#### **Serotonin / Noradrenaline**

This lecture will cover the mechanisms involved in synthesis and metabolism of serotonin and noradrenaline. Principle serotonergic and noradrenergic pathways in the CNS. Agonists and antagonists at receptors. Provide a general overview of therapeutic uses of drugs affecting 5HT, NA systems in the CNS.

#### **Acetylcholine / Dopamine**

This lecture will cover basic aspects of acetylcholine synthesis, storage and release. Nicotinic and muscarinic receptors in the brain and drugs which mediate cholinergic transmission in the CNS. An overview of cholinergic drugs used to treat CNS conditions. This lecture will cover pathways involved in dopamine synthesis and metabolism. Provide an overview of functional aspects of dopaminergic pathways in the brain (including motor control and behaviour). Pharmacology of drugs affecting dopamine; important adverse reactions to dopamine antagonists including the underlying mechanisms; selectivity of dopamine antagonists; types of dopamine receptors in the brain. Provide a brief summary of dopaminergic drugs used to treat brain disorders.

#### **Neuropeptides**

This lecture will cover the general characteristics of neuropeptides; how they act as neurotransmitters and neuromodulators; possible roles in modulating CNS functions; specific receptors; agonists and antagonists. Examples: substance P, neuropeptide Y and neurotensin

#### **ATP/NO as neurotransmitters**

ATP as a neurotransmitter; adenosine as a modulator; P1 and P2 classes of purinergic receptors; functional aspects of the receptors; drugs acting on the receptors. Nitric oxide, the only neurotransmitter not stored in vesicles; effects of nitric oxide; clinical conditions in which nitric oxide may play a role.

**Amino Acids**

Glutamate and GABA are amino acids that are key neurotransmitters within the mammalian CNS. This lecture will cover their synthesis and storage, the structure and function of glutamate and GABA receptors *in vivo* and look at some selective glutamatergic and GABAergic drugs.

**3. Brain disorders – and drugs used to treat them****Depression**

Monoamine theory of depression; pharmacology of antidepressant drugs (tricyclic antidepressants; monoamine oxidase inhibitors; "atypical" antidepressants); important adverse reactions to these drugs including the underlying mechanisms; mode of action of lithium

**Schizophrenia / Neuroleptic Drugs**

Neuroleptic drugs are drugs that are used to treat psychosis such as schizophrenia. This lecture will briefly describe what schizophrenia is and the neuroleptic drugs which are used to treat this disorder. This lecture will also cover the brain and peripheral neurotransmitter receptors which neuroleptic drugs interact with, the proposed mechanism of clinical action and the side effects associated with neuroleptic drug use.

**CNS control of Feeding / Obesity**

Obesity is a growing health problem and a major contributor to burden of disease in our society. This lecture will review the physiology of appetite control and the major potential therapeutic targets: fat absorption, food intake and thermogenesis. The mechanism of action of current anti-obesity drugs, their adverse effects, and central signals that are potential new therapies for obesity will be considered.

**Drug Addiction / Dependence**

This lecture provides an overview of the effects of chronic drug use on the CNS and the adaptive responses that underlay withdrawal and dependence. Key concepts include drug withdrawal and dependence, synapses and cell signalling and the modulation of neurotransmitters and biochemical pathways contributing to drug addiction. Signalling pathways modulated by drugs of abuse can provide new targets for treating drug addiction.

**Motor coordination: Parkinsons disease**

This lecture is an introduction to pharmacological treatments for Parkinson's diseases. Mechanisms of action, efficacy and side-effects of commonly used pharmacological treatments will be considered. Choice of treatment and other treatment issues will also be discussed.

**Epilepsy and anticonvulsants**

This lecture will provide an overview of the different types of epilepsy. Anticonvulsant drugs and how they work: (clonazepam, valproate, vigabatrin, phenobarbitone, primidone, phenytoin, carbamazepine, ethosuximide, trimethadione); adverse effects on CNS, blood and other tissues.

**Sedatives and Hypnotics**

This lecture will provide a brief overview of sleep and anxiety. We will discuss a number of different classes of pharmacological agents that are used to help with these conditions, their mechanism of action and potential side effects.

**Stroke and Neuroprotection**

This lecture will cover the incidence of stroke and the mechanisms involved in brain injury. It will provide an overview of the current therapies used to treat or prevent stroke in humans. There will be a mention of current clinical trials for stroke treatment and models used to identify neuroprotective drug candidates.

**Neurodegeneration**

These lectures will provide an overview of a number of neurodegenerative diseases (e.g. Alzheimer's disease, Amyotrophic lateral sclerosis, Huntingtons disease, Parkinson's disease); their pathophysiology, possible novel areas for therapeutic intervention and efficacy of current therapies.

**4. Analgesics / Anaesthetics****Pain and Analgesia in the CNS**

This lecture provides an overview of central nervous system mechanisms of pain and analgesia. It encompasses modulatory mechanisms in nociceptive pathways, neurotransmitters involved in nociception, chemical signalling and the pharmacology of drugs such as opioids which modulate pain.

**Local and General Anaesthetics**

This lecture will provide an overview of the different types of local and general anaesthetic agents. Mechanisms of action of a number of different commonly used anaesthetics. The central nervous system effects; sites of action; adverse effects; effects on axonal and synaptic transmission.

**5. Neurodevelopment and Neuroinflammation****Neuroinflammation**

This lecture will cover the immune response within the central nervous system including the description of cells involved, inflammatory mediators and examples of pathologies.

**Neurodevelopment**

This lecture will provide an overview of the role of neurotrophic factors in development. Neurotrophic factors, receptors and signaling pathways. Importance of neurotrophic factors as possible therapeutics in degenerative disorders.

**CNS drugs and blood brain barrier**

This lecture will discuss the blood brain barrier and its importance in protecting the brain and regulating the exchange of factors between the blood and brain. One problem facing the design of drugs for CNS disorders is blood brain barrier permeability, in particular large molecules are not able to get into the brain. Novel approaches to deliver agents to the brain will be discussed.

## Assessment Tasks and Due Dates

Task	Due Date
Practical Quizzes	Submit prior to leaving prac session
Mid Session Test	Wednesday 10 <sup>th</sup> September – <b><u>1-2pm</u></b>
Neuronal Toxicity Prac Report	Plan: Friday 10 <sup>th</sup> October – <b><u>in class</u></b> Results & Discussion: Friday 31 <sup>st</sup> October - <b><u>9am</u></b>
Research Debate Presentations	Friday 19 <sup>th</sup> September – <b><u>9-12pm or 1-4pm</u></b>
Research Debate Synopsis	Friday 26 <sup>th</sup> September – <b><u>9am</u></b>
Final Examination	Official Exam period

The individual 500 word synopsis is due exactly 1 week after your group has made their oral presentation.

**Neuropharmacology 2014 Timetable**

<b>Wk</b>	<b>Wk beginning (Mon)</b>	<b>Lecture 1 Monday 11-12pm Mathews D</b>	<b>Lecture 2 Wednesday 1-2pm WW LG03</b>	<b>Tutorials Thursday 11-12, 3-4pm Mathews 312</b>	<b>Practical Class Friday 9-12 or 1-4pm WW120</b>
1	28/7	<b>Introduction: Neurochemical transmission and neuromodulation</b> N. Jones / M. Morris	<b>Serotonin / Noradrenaline</b> N. Jones	<b>Assignment Information</b>	<b>NO PRAC CLASS</b>
2	4/8	<b>Acetylcholine / Dopamine</b> N. Jones	<b>ATP and NO as neurotransmitters</b> L. Liu	<b>Summarising Research Articles</b>	<b>Behavioural Pharmacology Research Debate Topics Distributed</b> N. Jones
3	11/8	<b>Amino Acids – Glutamate</b> N. Jones	<b>Amino Acids –GABA and Glycine</b> TBA	<b>Cutting Edge Research in Neuropharmacology – Animal models</b>	<b>Animal Handling / Group Work</b> T. Binder
4	18/8	<b>Neuropeptides as transmitters</b> M. Morris	<b>Neurotrophic factors</b> N. Jones	<b>CNS Neurotransmitters</b>	<b>Barbiturates</b> T. Binder
5	25/8	<b>Depression</b> M. Morris	<b>CNS control of Feeding/Obesity</b> M. Morris	<b>Cutting Edge Research in Neuropharmacology - Neuroimaging</b>	<b>Group Work – Research Debates</b>
6	1/9	<b>Neuroleptic Drugs and Schizophrenia</b> G.Smith	<b>Hypnotics and sedatives</b> N. Jones	<b>Treatments for Mood / Psychiatric Disorders</b>	<b>Neurogenesis computer exercise / Group Work</b>
7	8/9	<b>Pain and Analgesia in CNS</b> T. Binder	<b>Mid Session TEST</b>	<b>NO TUTORIAL</b>	<b>Narcotic analgesics</b> T. Binder
8	15/9	<b>Drug Addiction / Dependence</b> T. Binder	<b>Epilepsy and anticonvulsants</b> N. Jones	<b>Drugs of Addiction</b>	<b>Research Debate Presentations</b> Pharmacology Academics
9	22/9	<b>Motor coordination: Parkinsons disease</b> K. Double	<b>Stroke and Neuroprotection</b> N. Jones	<b>Neuronal toxicity prac preparation</b>	<b>Zebrafish behaviour</b> A Finch
<b>Mid Session Break 29<sup>th</sup> Sept-5<sup>th</sup> Oct</b>					
10	6/10	<b>No lecture PUBLIC HOLIDAY</b>	<b>General and Local Anaesthetics</b> N. Jones	<b>Cutting Edge Research in Neuropharmacology - Epigenetics</b> M.Morris	<b>Neurodegeneration: Parkinsons disease</b> N. Jones / K. Double
11	13/10	<b>Neurodegeneration I</b> R. Grant	<b>Neurodegeneration II</b> R. Grant	<b>Treatments for Neurological Disorders</b>	<b>Tissue Culture – neuronal toxicity</b> N. Jones
12	20/10	<b>CNS drugs and blood brain barrier</b> N. Jones	<b>Neuroinflammation</b> G.Moalem-Taylor	<b>Exam Revision Quiz</b>	<b>Tissue Culture – neuronal toxicity data analysis</b> N. Jones

Assessments: Mid Session test week 7 (Mon 11-12); Research debate presentations week 8, synopsis due week 9 (Friday 9am); Neuronal toxicity prac report week 10 (experimental plan), week 13 (results and discussion)

## **Group Assignment Information**

Students will work in teams of 3-4 to research a “Controversial Research Topic in Neuropharmacology”. Each group member must participate in the development of an argument for or against the topic and in the prac class in week 8, groups will make their presentations. Topics will be assigned to groups in the first prac class session. Individual group members will be required to submit a 500 word synopsis of their own debate and research into the topic. This assessment task will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate your ability to work in a team and collaborate successfully. Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the student enquiry counter, located on the ground floor of the Student Inquiries Office (G27), BSB Office, Biological Sciences. The report must also be submitted electronically *via* Moodle, through Turnitin. A penalty will apply for late submissions (10% per day).

**Groups:** Will be assigned in the first prac class session. Each group will be assigned a topic in this class.

### **General Instructions**

Groups will need to examine and critically evaluate the available evidence on their topic. They will be required to use available experimental and clinical data in order to reach a conclusion. The validity of the evidence needs to be considered and discussed.

### **Group Oral presentation (10%)**

- Groups will construct a debate on the assigned topic and prepare a presentation from their research.
- One member of the group will give the presentation, while other group members will be required to help with the rebuttal and answer questions following the presentation.
- The oral presentation (per group) will be a maximum of 8 minutes in length and will be followed by a 2 minute rebuttal (per group) and 5 minutes of question time per topic.

### **Individual Written Synopsis (5%)**

The individual written synopsis should include the following information:

- A brief introduction to the topic and why it is controversial.
- Discuss the pharmacological issues (receptors, drug, side effects, interactions), disease condition, methods used to assess drug efficacy in experimental and clinical studies and how these studies have led to advances in our understanding of a CNS disorder.
- Evaluate the available evidence and reach a conclusion about your research topic.

### **Overall Assignment Assessment**

- The synopsis and debate will be worth 15% of your total grade.
- The oral presentation will be assessed by two members of Pharmacology staff and one peer group (see attached). You will also be required to keep a log of your group work contributions using Mahara EPortfolio (this requirement will be further outlined in the Assignment Information Tutorial).

**Research Debates:** will be presented in random order in the prac sessions of week 8 (Friday 19<sup>th</sup> September – 9-12 or 1-4pm).

**Due Date of Individual Written Synopsis:** Friday 26<sup>th</sup> September – (9am - submitted via Turnitin). 10am submission of hardcopy at BSB office.

**Please Note:** A penalty will apply for late submissions (10% per day).



**GROUP ASSIGNMENT – INDIVIDUAL SYNOPSIS : MARKING CRITERIA**

	<b>Exemplary</b> (>8.5)	<b>Very Good</b> (8.4-7.5)	<b>Good</b> (7.4-6.5)	<b>Satisfactory</b> (6.4-5.0)	<b>Unacceptable</b> (<5.0)
<b>Title &amp; Formatting</b> ____/10 x 0.5	Title clearly indicates the subject matter of the paper. Name and student number and departmental address given. Word count 500 ± 50	Title indicates the subject matter of the paper. Name and student number and departmental address given. Minor errors in formatting. Word count 500 ± 50	Title indicates the subject matter of the paper. Name and student number and departmental address given. Errors in formatting. Word count 500 ± 50	Title does not indicate the subject matter of the paper. Name and student number and departmental address given. Errors in formatting. Word count >550	Title, author's name and/or address not given. Formatting requirements not followed. Word count >550 or <450.
<b>Introduction</b> ____/10 x 2.5	Focused introduction to the topic and explanation of the controversy. Concise and clear account of the pharmacological issues, disease condition and methodologies used to assess efficacy.	Introduction to the topic and explanation of the controversy. Clear account of the pharmacological issues, disease condition and methodologies used to assess efficacy. Minor omissions or errors.	Introduction to the topic and some explanation of the controversy. Clear account of the pharmacological issues, disease condition and methodologies used to assess efficacy. A few factual errors or omissions.	Some introduction to the topic and explanation of the controversy. Some of the pharmacological issues, disease condition and methodologies used to assess efficacy are described. More detail needed.	No real introduction to the topic or explanation of the controversy. Some of the issues, disease condition and methodologies used to assess efficacy are mentioned. Lacking detail.
<b>Discussion &amp; Conclusion</b> ____/10 x 4	Critical evaluation of the issues identified and supported by chosen sources. A well balanced and logical presentation that explores available evidence supporting / against your topic. Re-stated key findings and main conclusions conveyed in a final paragraph.	Critical evaluation of the issues identified and supported by chosen sources. A balanced and logical presentation that explores available evidence supporting / against your topic. Some re-stating of key findings and main conclusions conveyed in a final paragraph.	Some critical evaluation of the issues identified. A mostly balanced and logical presentation that explores available evidence supporting / against your topic. Some re-stating of key findings and conclusions conveyed in a final paragraph.	Some critical evaluation of the issues identified. A mostly balanced and logical presentation that explores available evidence supporting / against your topic. Some errors in interpretation. Some re-stating of key findings and some conclusions conveyed in a final paragraph.	No critical evaluation of the issues identified and supported by chosen sources. No balance or logic to presentation. Main conclusions not conveyed in a final paragraph.
<b>Referencing</b> ____/10 x 0.5	In-text citations and reference list follow BJP conventions. Relevant information selected. A wide range of references used.	In-text citations and reference list follow BJP conventions. Relevant information selected. A wider range of references needed.	In-text citations and reference list follow BJP conventions, with minor errors. Relevant information selected. A wider range of references needed.	In-text citations and/or reference do not follow BJP conventions. Relevant information selected. A wider range of references needed.	BJP conventions not followed. Non-peer reviewed sources used. Information is not referenced. Wider range of references needed.
<b>Writing Conventions</b> ____/10 x 2.5	Excellent sentence structure, correct grammar and word usage. Sentences and paragraphs well connected. Appropriate written expression- using discipline specific vocabulary and formal not oral language. Has been proof read.	Very good sentence structure, correct grammar and word usage. Sentences and paragraphs well connected. Appropriate written expression- using discipline specific vocabulary and formal not oral language. Proof reading needed to eliminate minor errors.	Good sentence structure, correct grammar and word usage. Sentences and paragraphs not always well connected. Appropriate written expression- better use of discipline specific vocabulary and formal not oral language needed. Proof reading needed.	Poor sentence structure, grammar and word usage. Sentences and paragraphs not well connected. Appropriate written expression- better use of discipline specific vocabulary and formal not oral language needed. Proof reading needed.	Use of paragraphs and improved sentence structure needed. The report is difficult to read due to poor grammar and word usage. No evidence of proof reading.
<b>TOTAL</b> <b>/100</b>					

**Additional Comments:**

**Group Debate  
Academic Assessment Form**

**Group:** .....

**Topic:** .....

	<b>Mark (/10)</b>
<b>Presentation</b>	
Brief introduction to topic. Why is the topic controversial?	/10
Critical evaluation of the literature	/10
Concluding statement to summarise the group's argument	/10
<b>Questions</b>	
Students understand the questions and answers are appropriate	/10
<b>Overall impression – <u>were you persuaded?</u></b>	/10
<b>Total (Mark / 50)</b>	<b>/50</b>

**Comments:**

**Strengths:**

**Improvement:**

**Points for clarification (if necessary)**

Assessor: ..... (sign)      Date: .....

**Group Debate  
Peer Assessment Form**

**Group:** .....

**Topic:** .....

**Peer Group members:**

Name: .....

Name: .....

Name: .....

Name: .....

	<b>Mark (/10)</b>
<b>Presentation</b>	
Brief introduction to topic. Why is the topic controversial?	<b>/10</b>
Critical evaluation of the literature	<b>/10</b>
Concluding statement to summarise the argument	<b>/10</b>
<b>Questions</b>	
Students understand the questions and answers are appropriate	<b>/10</b>
<b>Overall impression – <u>were you persuaded?</u></b>	<b>/10</b>
<b>Total (Mark / 50)</b>	<b>/50</b>

**Comments:**

**Strengths:**

**Improvement:**

**Points for clarification (if necessary)**